AMENDMENTS TO THE CLAIMS

1. (Currently amended) A pixel cell for an image sensor, the pixel cell comprising:

a photodiode for generating charge in response to light and for amplifying the generated charge, the photodiode being ~~over a surface of a substrate~~ formed within a substrate and below an upper surface thereof and comprising at least two of a first layer having a first band gap and at least two of a second layer having a second band gap, wherein the first layers are alternated with the second layers; [[and]]

a gate of a transistor adjacent to the photodiode for transferring the amplified charge from the photodiode[[.]] ; and

a graded buffer layer beneath a bottom layer of the photodiode.

2. (Original) The pixel cell of claim 1, wherein a difference between the conduction band energies of the first layer and the second layer is greater than a difference between the valence band energies of the first layer and the second layer.

3. (Previously presented) The pixel cell of claim 1, wherein a difference between the valence band energies of the first layer and the second layer is greater than a difference between the conduction band energies of the first layer and the second layer.

4. (Original) The pixel cell of claim 1, wherein the layers are configured to promote ionization by a first carrier type and suppress ionization by a second carrier type.

5. (Previously presented) The pixel cell of claim 1, wherein the layers are each formed of a material selected from the group consisting of Si, Si_xGe_{1-x}, $Si_xGe_{1-x}C_y$, GaAs, GaAlAs, InP, InGaAs, and InGaAsP.

6. (Original) The pixel cell of claim 1, wherein the first layer is Si and the second layer is SiGe.

7. (Previously presented) The pixel cell of claim 6, wherein the layers of Si are doped to a first conductivity type and wherein the layers of SiGe are doped to a second conductivity type.

8. (Original) The pixel cell of claim 6, wherein the photodiode comprises at least four layers of Si and at least four layers of SiGe, wherein the layers of Si are alternated with the layers of SiGe to form an Si/SiGe structure, wherein at least a first subset of layers is doped to a first conductivity type, and wherein at least a second subset of layers is doped to a second conductivity type.

9. (Original) The pixel cell of claim 1, wherein the first layer is Si_xGe_{1-x} and the second layer is Si_yGe_{1-y}.

10. (Original) The pixel cell of claim 1, wherein the first layer is $Si_xGe_{1-x}C_y$ and the second layer is $Si_xGe_yC_z$.

11. (Original) The pixel cell of claim 1, wherein at least a portion of the photodiode is at a level below the level of a top surface of the substrate.

12. (Original) The pixel cell of claim 1, wherein the photodiode comprises approximately 10 to approximately 100 layers.

13. (Original) The pixel cell of claim 1, wherein each of the layers have a thickness of approximately 50 Angstroms to approximately 300 Angstroms.

14. (Canceled)

15. (Previously presented) The pixel cell of claim 1, further comprising a reset transistor for resetting the photodiode to a predetermined voltage.

16. (Original) The pixel cell of claim 1, further comprising a floating diffusion region, wherein the transistor is a transfer transistor for transferring charge from the photodiode to the floating diffusion region.

17. (Original) The pixel cell of claim 1, wherein the photodiode is part of a CMOS image sensor.

18. (Original) The pixel cell of claim 1, wherein the photodiode is part of a charge coupled device image sensor.

19. (Original) The pixel cell of claim 1, wherein the substrate is a silicon-on-insulator substrate.

20. (Currently amended) An image sensor comprising:

an array of pixel cells at a surface of a substrate, wherein at least one of the pixel cells comprises a photodiode formed within the substrate and below an upper surface thereof, the photodiode comprising at least two of a first layer comprising a first material and at least two of a second layer comprising a second material, wherein the layers are configured such that a difference between the conduction band energies of the first and second materials and a difference between the valence band energies of the first and second materials promotes ionization by a first carrier type and suppresses ionization by a second carrier type and wherein the first layers are alternated with the second layers; [[and]]

a gate of a transistor adjacent to the photodiode for transferring the amplified charge from the photodiode[[.]] ; and

a graded buffer layer beneath a bottom layer of the photodiode.

21. (Previously presented) The image sensor of claim 20, wherein the first and at least second materials are selected from the group consisting of Si, Si_xGe_{1-x}, $Si_xGe_{1-x}C_y$, GaAs, GaAlAs, InP, InGaAs, and InGaAsP.

22. (Original) The image sensor of claim 20, wherein the first material is Si and the second material is SiGe.

23. (Previously presented) The image sensor of claim 22, wherein the layers of Si are doped to a first conductivity type and wherein the layers of SiGe are doped to a second conductivity type.

24. (Original) The image sensor of claim 22, wherein the photodiode comprises at least four layers of Si and at least four layers of SiGe, wherein the layers of Si are alternated with the layers of SiGe to form a Si/SiGe structure, wherein at least a first subset comprising two layers of Si and two layers of SiGe is doped to a first conductivity type, and wherein at least a second subset comprising two layers of Si and two layers of SiGe is doped to a second conductivity type.

25. (Original) The image sensor of claim 20, wherein the first material is Si_xGe_{1-x} and the second material is Si_yGe_{1-y}.

26 (Original) The image sensor of claim 20, wherein the first material is $Si_xGe_{1-x}C_z$ and the second material is $Si_xGe_yC_z$.

27. (Original) The image sensor of claim 20, wherein the photodiode comprises approximately 10 to approximately 100 layers.

28. (Previously presented) The image sensor of claim 20, further comprising a reset transistor for resetting the photodiode to a predetermined voltage.

29. (Original) The image sensor of claim 20, further comprising a floating diffusion region, wherein the transistor is a transfer transistor for transferring charge from the photodiode to the floating diffusion region.

30. (Original) The image sensor of claim 20, wherein the pixel cell further comprises readout circuitry connected to a floating diffusion region for reading out charge.

31. (Original) The image sensor of claim 20, further comprising circuitry peripheral to the array, the peripheral circuitry being at a surface of the substrate, wherein the substrate is a silicon-on-insulator substrate.

32. (Currently amended) An image sensor comprising:

an array of pixel cells, wherein at least one of the pixel cells comprises:

a photodiode formed below an upper surface of a substrate, the photodiode comprising at least two layers of Si alternating with at least two layers of Si_xGe_{1-x}; [[and]]

a gate adjacent to the photodiode for transferring the amplified charge from the photodiode[[.]] ; and

a graded buffer layer formed within the substrate and below the photodiode.

33. (Original) The image sensor of claim 32, wherein x is approximately 0.5, wherein the layers of Si are doped to a first conductivity type, and wherein the layers of Si_xGe_{1-x} are doped to a second conductivity type.

34. (Original) The image sensor of claim 32, wherein x is approximately 0.5, and wherein first and at least second subsets of the layers are doped to first conductivity and second conductivity types, respectively.

35. (Currently amended) A processor system, comprising:

a processor; and

an image sensor coupled to the processor, the image sensor comprising:

an array of pixel cells, at least one of the pixel cells comprising:

a photodiode formed below an upper surface of a substrate, the photodiode comprising at least two layers of a first material alternating with at least two layers of a second material, wherein the first and second materials are selected from the group consisting of Si, Si_xGe_{1-x}, $Si_xGe_{1-x}C_y$, GaAs, GaAlAs, InP, InGaAs, and InGaAsP, and wherein the layers are configured to promote ionization by a first carrier type and suppress ionization by a second carrier type;

a graded buffer layer formed beneath the photodiode;

a gate of a transistor adjacent to the photodiode;

a floating diffusion region electrically connected to the first transistor; and

readout circuitry electrically connected to the floating diffusion region.

36. (Original) The system of claim 35, wherein a difference between the conduction band energies of the first and second materials is greater than a difference between the valence band energies of the first and second materials.

37. (Original) The system sensor of claim 35, wherein a difference between the valence band energies of the first and second materials is greater than a difference between the conduction band energies of the first and at least second materials.

38-54. (Canceled)

55. (New) A pixel cell for an image sensor, the pixel cell comprising:

a photodiode for generating charge in response to light and for amplifying the generated charge, the photodiode being formed within a substrate and below an upper surface thereof and comprising at least two of a first layer having a first band gap and at least two of a second layer having a second band gap, wherein the first layers are alternated with the second layers; and

a gate of a transistor adjacent to the photodiode for transferring the amplified charge from the photodiode.

56. (New) A pixel cell for an image sensor, the pixel cell comprising:

a photodiode for generating charge in response to light and for amplifying the generated charge, the photodiode comprising at least two of a first layer having a first band gap and at least two of a second layer having a second band gap, wherein the first layers are alternated with the second layers;

a gate of a transistor adjacent to the photodiode for transferring the amplified charge from the photodiode; and

a graded buffer layer beneath a bottom layer of the photodiode.